HW:

Pages 335-338: 2, 6, 12, 14, 23, 29

2. Growth of Bacteria The number N of bacteria present in a culture at time t (in hours) obeys the model $N(t) = 1000e^{0.01t}$.
  (a) Determine the number of bacteria at $t = 0$ hours.
  (b) What is the growth rate of the bacteria?
  (c) Graph the function using a graphing utility.
  (d) What is the population after 4 hours?
  (e) When will the number of bacteria reach 1700?
  (f) When will the number of bacteria double?

6. Bacterial Growth A culture of bacteria obeys the law of uninhibited growth.
  (a) If N is the number of bacteria in the culture and t is the time in hours, express N as a function of t.
  (b) If 500 bacteria are present initially and there are 800 after 1 hour, how many will be present in the culture after 5 hours?
  (c) How long is it until there are 20,000 bacteria?

12. Estimating the Age of a Fossil A fossilized leaf contains 70% of its normal amount of carbon 14.
  (a) How old is the fossil? Use 5700 years as the half-life of carbon 14.
  (b) Using a graphing utility, graph the relation between the percentage of carbon 14 remaining and time.
  (c) Using INTERSECT, determine the time that elapses until half of the carbon 14 remains.
  (d) Verify the answer found in part (a).

14. Newton's Law of Cooling A thermometer reading 72°F is placed in a refrigerator where the temperature is a constant 38°F.
  (a) If the thermometer reads 60°F after 2 minutes, what will it read after 7 minutes?
  (b) How long will it take before the thermometer reads 39°F?
  (c) Using a graphing utility, graph the relation between temperature and time.
  (d) Using INTERSECT, determine the time needed to elapse before the thermometer reads 45°F.
  (e) TRACE the function for large values of time. What do you notice about y, the temperature?

23. Population of a Bacteria Culture The logistic growth model

$$P(t) = \frac{1000}{1 + 32.33e^{-0.439t}}$$

represents the population (in grams) of a bacterium after t hours.
  (a) Determine the carrying capacity of the environment.
  (b) What is the growth rate of the bacteria?
  (c) Determine the initial population size.
  (d) Use a graphing utility to graph $P = P(t)$.
  (e) What is the population after 9 hours?
  (f) When will the population be 700 grams?
  (g) How long does it take for the population to reach one-half the carrying capacity?

29. Birthdays The logistic model

$$P(n) = \frac{113.3198}{1 + 0.115e^{0.0912n}}$$

models the probability that, in a room of n people, no two people share the same birthday.
  (a) Use a graphing utility to graph $P = P(n)$.
  (b) In a room of $n = 15$ people, what is the probability that no two share the same birthday?
  (c) How many people must be in a room before the probability that no two people share the same birthday falls below 10%?
  (d) What happens to the probability as n increases? Explain what this result means.